THE CLIMATE OF EAST LONDON, CAPE COLONY.

By J. R. Sutton, M.A., F.R.Met.S.

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This paper is a brief summary and discussion of the meteorological observations made at the West Bank, East London, during the 21 years 1884–1904, under the direction of the Harbour Board. My object in undertaking the work is chiefly to amplify the results obtained in some of my previous papers dealing with the meteorology of the table-land of South Africa.

Speaking generally, the material made use of here is not of the best—not nearly so good as that available for Kimberley (G. J. Lee), or for Durban. The observing hour seems to have been altered once or twice to one side or the other of 8 a.m., and also the manner of taking the readings. The observers have varied much in ability; and there is, unfortunately, considerable evidence that some of them regarded the work of reading the instruments as irksome, and did it in the most perfunctory manner. In computing the averages I have not hesitated to reject all the readings which show signs of negligence. Whole months, occasionally, defy explanation, and these have been rejected altogether. For instance, ten consecutive days are given below as a specimen of how meteorological observations ought not to be taken. It is an extract from one of the rejected months, giving the dry and wet bulbs at the hour of observation, the reading of the maximum and minimum air temperatures for the preceding 24 hours, and the readings of the maximum and minimum thermometers when reset at the hour of observation. The dates are purposely omitted :—

Hygrometer.		Preceding 24 Hours.		Reset.	
Dry Bulb.	Wet Bulb.	M.	*m.*	M.	*m.*
48°	44°	68°	42°	62°	47°
49	45	67	57	43	59
50	50	71	48	66	52
50	50	70	50	43	50
51	51	73	64	50	66
50	49	68	51	44	54
60	60	70	61	45	62
57	52	67	51	49	51
61	61	68	60	51	60
50	52	68	56	46	58

No information is given in the Register concerning the position or mounting of the instruments, or as to what corrections are necessary for index-error; and, indeed, it is not likely that such corrections would make any material improvement. For these reasons it is safer to consider the mean values given below as approximately comparable *inter se*, rather than as directly comparable with other registers. The following notes from the Inspection Reports of the Cape Meteorological Commission contain nearly all my information about the instruments:—

1883.—Fortin's Cistern Barometer, set of Thermometers, and a Rain Gauge, all in good order.

1884.—The Cistern Barometer at this station being found faulty, it was exchanged for the one belonging to the Port Office until a new one could be supplied. All the Thermometers and the Rain Gauge were in good order.

1886.—The instruments here were in good order.

1888.—The instruments at this station were all in good order. The exposure of the thermometer, however, in the Stevenson Screen was not good; it was too close to the ground, and in too confined a spot. I arranged for its removal to a more suitable place.

1891.—The instruments at East London are in and about the office of the Port Captain on the west or right bank [of the Buffalo River]. . . . I found the whole in good order and well kept, and the records neatly made up to date.

There is also a note in the Report for 1896 to the effect that the index error of the Barometer = + ·012 inch.

In addition to this, Mr. S. R. Pockley, the Secretary to the Harbour Board, informs me that "the distance of the thermometer screen from both sea and river is about 150 feet, and about 45 feet above mean sea-level. There has been no material alteration in the position of the instruments during the period January 1, 1884, to present date."

With regard to the dates, it should be remembered that the values of maximum and minimum temperature and rainfall are for the 24 hours ending 8 a.m. of the date of entry, the first and third not having been credited, as is usual in England, to the previous day.

The approximate monthly mean and extreme barometric pressures

reduced to a temperature of 32° are given in the following Table, together with the total range observed in 21 years :—

	Means.	Maxima.	Minima.	Range.
	inches.	inches.	inches.	inch.
Jan.	29·920	30·320	29·373	·947
Feb.	·940	·302	·550	·752
Mar.	·965	·390	·526	·864
April	30·019	·508	·630	·878
May	·056	·596	·335	1·261
June	·127	·512	·664	·848
July	·139	·648	·611	1·037
Aug.	·102	·718	·551	1·167
Sept.	·096	·616	·549	1·067
Oct.	·031	·623	·462	1·161
Nov.	29·973	·450	·427	1·023
Dec.	·940	·377	·497	·880
Year	30·026	30·718	29·335	1·383

The annual variation of pressure is of the same order as that obtaining at Durban and Kimberley, namely, greatest in July and least in January. It would appear, however, from the general run of these monthly means that the turning-points of the smoothed curve of pressure are a day or two later at East London than they are at Durban, just as those of Durban are a day or two later than they are at Kimberley. The range of monthly means from January to July is ·22 inch, or about ·02 inch less than the ranges at Durban and Kimberley, but practically the same as that of Philippolis and Aliwal North. It is therefore typical of the pressures of the low lands surrounding the South African table-land, and no doubt depends in some way (as in the case of Durban) upon the variation of maximum temperatures inland. The greatest pressure observed during the period under review was 30·718 inches, the least 29·335 inches, giving a total range of 1·383 inch. This is rather greater than the range found for Durban in the ten years 1888–97 (*i.e.*, 30·801 – 29·507 = 1·294 inch). The Durban observations, however, are made twice a day, at 9 a.m. and 3 p.m., while the East London observations are only made once, at 8 a.m. Were observations made at East London also at 3 p.m., we should expect still lower minimum pressures, and therefore it seems to follow that the total range at East London must be somewhat greater than that at Durban, while the actual mean pressure at the former place would be somewhere about a tenth of an inch the lesser. The greatest ranges of pressure are found in May, and in July–November, being

nearly half as great again as those of the other months, including June. Exactly the same rule holds for Durban. It is during these months of greatest range of pressure on the coast that dust storms are most frequent over the central table-land.

The mean monthly maximum and minimum temperatures, and their arithmetic mean; also the greatest and least observed in any month, and the total range, are given below:—

	Mean Maxima.	Extreme Maxima.	Mean Minima.	Extreme Minima.	$\frac{M+m}{2}$	Range.
	°	°	°	°	°	°
Jan.....	75·6	97	64·3	52	70·0	45
Feb. ...	75·6	91	64·7	54	70·2	37
Mar. ...	74·6	101	62·6	51	68·6	50
April ...	73·1	106	59·2	47	66·1	59
May ...	71·5	94	53·7	42	62·6	52
June ...	71·4	91	50·3	39	60·9	52
July ...	69·5	93	49·2	36	59·3	57
Aug. ...	69·5	98	51·7	37	60·6	61
Sept. ...	69·1	98	54·5	43	61·8	55
Oct.....	70·1	98	56·9	43	63·5	55
Nov. ...	71·8	88	59·9	48	65·9	40
Dec. ...	74·6	94	62·7	47	68·6	47
Year ...	72·2	106	57·5	36	64·9	70

The curve of mean maximum reaches its highest value about the end of January, lagging a month behind the solstice; but its lowest value is more than two months later than the sun. The curve of mean minimum reaches its highest value during the first week of February, and its lowest during the first half of July. These epochs are probably largely determined by the differences of temperature between land and sea. There is a remarkable difference between the annual ranges of the curves of mean maximum and mean minimum: the mean maximum temperature of the winter months being only 6° or 7° lower than the mean maximum of the summer; whereas the mean minimum temperature has a range more than twice as great. This is in sharp contrast to the ranges over the central table-land, for at Kimberley, for example, the range of mean maximum is perhaps 30°, and that of mean minimum 24°. The small variation of the mean maximum temperature at East London throughout the year is largely due to the frequent hot winds of the winter months; while the night temperatures during the winter may be reduced more than they are in the summer by the land breeze. The highest shade temperature on record is 106°, the lowest 36°, giving a total range of 70°.

The high absolute maximum temperatures during the winter months are one of the most noteworthy features in the climate of

the south and west coasts of South Africa. They generally come with a low barometer, and winds from some inland direction, and are excessively dry. Sparrman, who appears to have been perhaps the first to describe them, relates that "in the months of May, June, and July (which about the Cape elsewhere are the winter months, and are attended with copious rains) it is here quite dry, though frequently rather cool and bleak. The north-west wind at this time prevails here, as well as at the Cape; sometimes the wind veers about to the north, and brings with it the warmth of summer—a change which frequently occasions the milch-cows in Houtniquas to grow stiff in the joints. I was assured that it never rained when this north wind prevailed, probably on account of the chain of mountains, which, extending from east to west, proves a barrier to keep the clouds on the other side; or else by virtue of their attraction detains these condensed vapours on their summits." *

There was an exceptionally good observer at East London during a few months of 1886. He notes a maximum of 80° for the 24 hours ending 8 a.m., August 26th, and one of 92° in the following 24 hours, and makes the following remarks:—

(1) "Max. 80° is the actual temperature at the time of observation due to an exceedingly hot wind blowing. At no time during the previous 24 hours would the mercury have reached anything like this figure."

(2) "The cup of water on the wet-bulb thermometer was filled up at 8 a.m. when the observations were made, but on examination an hour after was found to be half empty, showing how great was the evaporation induced by the above-mentioned hot wind."

The same observer also remarks on the hot wind of September 11th, in which the temperature reached 98°: "Calm till 9 a.m. Hot wind from N. then set in, lasting all day, similar to that experienced on August 26th. This wind is an awful infliction while it lasts, as it feels red-hot."

These winds seem to be almost entirely confined to the hours of daylight. In no case do they seem to have very much effect upon the nocturnal temperatures, very seldom raising them more than 10°.

It has been stated that these hot winds last sometimes for several days; the "man in the street" affirms roundly that they last for a week. But such is not the case at East London, at any rate, although once or twice it has happened that there have been two

* A. Sparrman, *A Voyage to the Cape of Good Hope*, Sec. Ed., 1786, vol. i., p. 281. Sparrman refers here to the country between Cape Town and what is now Port Elizabeth.

hot winds on two consecutive days, and now and then two in a week. For example :—

	m.	8 a.m.	M.
1889, April 11	65°	90°	106°
12	67	68	90
13	64	64	80
14	62	71	90
15	68	90	98
16	65	66	80

Here we see that although there were hot winds on the 11th, 12th, 14th, 15th, the mornings (as shown by the minimum temperatures) always opened cool. To the unobservant this would appear to have been a hot wind lasting a week. It should be mentioned that the high temperatures of the 11th and 12th are due to one barometric depression, those of the 14th and 15th to another.

At East London the seasonal distribution of hot winds is very pronounced, there being two maxima of frequency, one in the late spring and the other in the early autumn.* During the whole of summer and the middle of winter they are rare,† as will be seen from the Table below, giving the frequency expressed in the number of times observed in 21 years :—

	Above 90°.	20° above the Mean.		Above 90°.	20° above the Mean.
	No.	No.		No.	No.
Jan.	1	1	July	1	1
Feb.	1	...	Aug.	13	18
Mar.	2	1	Sept.	8	10
April	6	5	Oct.	3	4
May	9	7	Nov.	...	...
June	1	...	Dec.	2	...
			Total	47	47

In this matter of seasonal distribution they differ in a marked manner from the less frequent though fiercer hot winds of Durban, for at the latter place they are confined almost entirely to the spring and early summer. On the other hand, judging from the Reports

* Over the coast districts further west there is a similar semi-annual rainfall period.

† There are, however, frequently, in the winter, warm winds, say 15° above the mean of the month.

of the Cape Meteorological Commission, they are more frequent in the winter on the west coast than they are (during the same season) on the south. Stewart gives the following monthly distribution of a total of 41 days upon which hot winds blew at Port Nolloth during 1900 * :—

April	1	July	12
May	6	Aug.	8
June	11	Sept.	3

Their periodicities, therefore, probably depend mainly upon the annual movements of the permanent anticyclones of the southern hemisphere.

There seems to be no doubt that these hot winds originate on the table-land, albeit every northerly wind, even with a low barometer, is not necessarily a hot wind.† The following Table gives the

Synoptic Elements during a Hot Wind at East London.

	Pressure.			Temperature.		
	East London.	Durban.	Kimberley.	East London.	Durban.	Kimberley.
	inches.	inches.	inches.	o	o	o
Third day before	30·149	30·248	26·264	68	78	75
Second day before	30·171	30·309	26·290	69	77	77
First day before	30·111	30·288	26·276	75	79	79
Day.....	29·902	30·144	26·233	92	82	79
First day after ...	29·988	30·086	26·201	70	82	76
Second day after	30·095	30·219	26·219	70	78	76
Third day after...	30·125	30·296	26·231	69	79	78

average pressure and average maximum temperature conditions for the fifteen most strongly marked hot winds blowing at East London in the four years 1897–1900, for the seven days of which the middle day is the day of the hot wind, together with the corresponding synoptic elements for Kimberley and Durban. At East London itself the day of a hot wind generally opens with the wind somewhere about north-west, and not very much cloud; at the same time at Kimberley the wind is fairly strong between north and north-east and the sky clear; at Durban calms or north-east winds are the rule, and clear skies.

* C. Stewart, *Science in South Africa*, Art. "Meteorology," p. 40, 1905. The temperatures are not given.

† Sparrman was informed that on the Krombeek River, some distance east of Swellendam, "the west wind was the warmest; but what was very extraordinary was that the north wind was the coldest" (*Voyage*, vol. ii., p. 329).

Exactly as was found in the case of the hot winds of Durban,* so we find the temperatures and pressures of Kimberley well above the normal during the first half of the week, with a sudden fall to a lower temperature afterwards, and a gradual fall to a lower pressure. The variations of temperature and pressure at Durban are in the same direction as at East London, though they come rather later, and the variation of temperature is much less pronounced.

When the temperatures and pressures at East London and Durban on the day of a hot wind at the latter place are compared with the same elements on the day of a hot wind at the former, we find some very striking dissimilarities. Thus when the hot wind prevails at East London the barometer falls on an average during four days to the minimum ·247 inch at East London, and ·223 inch at Durban, the corresponding rises of temperature being 24° and 4° respectively; but when the hot wind is at Durban the barometer falls in the same period of time to the minimum ·356 inch at Durban and ·289 inch at East London, the corresponding rises of temperature being 24° at Durban and practically nothing at East London. That is to say, the depression which determines such a wind is actually deeper at East London when there is a hot wind at Durban than it is at East London itself when the hot wind is there. But there is this important distinction—that when the hot wind is at East London the direction there is about north-westerly (*i.e.*, from inland), whereas when the hot wind is at Durban the wind at East London is south-westerly (*i.e.*, up the coast).

Synoptic Elements during a Hot Wind at Durban, 1886–1904.

	Pressure.		Temperature.	
	Durban.	East London.	Durban.	East London.
	inches.	inches.	o	o
Third day before	30·151	30·029	80	71
Second day before	30·130	30·020	84	72
First day before	30·058	29·901	84	74
Day	29·795	29·740	104	73
First day after	30·136	30·025	80	71
Second day after	30·131	30·087	81	72
Third day after	30·145	30·097	80	70

Taking into account, therefore, the synoptic conditions prevailing

* See J. R. Sutton, "Some Pressure and Temperature Results," &c., *Trans. S. A. Phil. Soc.*, vol. xi., part 4, p. 273.

at Durban, East London, and Kimberley, while a hot wind is blowing at either of the former places, and the fact that the direction is always off-shore, there surely can be no reasonable doubt remaining that they are true Foehn winds, strongly resembling those of the lower slopes of the Alps described by Hann.* Nevertheless this is not to say that a South African hot wind is wholly explained. There seems to be a probability that some subsidiary process is involved in generating these high temperatures in addition to the adiabatic heating of a downcast current of air. We have seen that there are occasional temperatures during April of 90° at 8 a.m. at East London. Now the April mean temperature of the air at Queenstown, 100 miles north-west from East London, at 8 a.m., is 57°·6. If this air could flow at once to East London it would acquire a temperature, due to compression in falling 3,500 feet, of about 18°·7 more, making it 76°·3. We shall have, therefore, to account in some way for another 14° to get the observed temperatures. But air from inland must necessarily take time to reach the coast, so that Queenstown air would have to start some hours before 8 a.m. to get to East London at that time. If we assume that it starts before sunrise while at its mean minimum temperature of about 49°, it would acquire an additional 18°·7 in its descent and a small rise on account of diurnal temperature variation. This last would be less than it would have experienced if it had remained at Queenstown, because the coast variation is much less. It seems, then, that we have nearly 20° to account for if we assume the air to start from Queenstown at its normal temperature. Of course the temperature at Queenstown may be higher than usual to begin with, as it is at Kimberley at the same time; but it is not likely to be 20° above the normal. And if it were we should still have to account for it at Queenstown instead of at East London, and so only have shifted the incidence of our difficulty. At King William's Town, 30 miles from East London and 1,300 feet above the sea, the April mean temperature of the air at 8 a.m. is 63°·6. Adding 7° for adiabatic increase of temperature due to compression, and we have, as before, nearly 20° of rise still to explain, assuming the air to start from King William's Town at its normal temperature. Of course, if the rise of temperature is all adiabatic, then we must conclude that the air has started from higher levels, above the surface, say from an altitude of 7,000 feet at a temperature of about 53°. But it seems more likely

* See, *inter alia*, J. Hann, *Met. Zeit.*, January, 1904, p. 42. C. Stewart, *Science in South Africa*, p. 40. Also for comparison, Bartholomew's *Atlas of Meteorology*, p. 33 and Plate 32, 1899. J. Hann, *Lehrbuch der Met.*, p. 595, 1901. *Handbook of Climatology*, ch. xix., 1903.

that the friction of a dust-laden air may account for some, at any rate, of the 20° we want.

The surface temperatures of the sea have been observed regularly at East London since 1897. They fall upon a curve very similar to that of the maximum temperatures of the air, with the same long-drawn-out minimum from July to September.* Monthly averages are :—

Jan.	67°	July	61°
Feb.	66	Aug.	61
Mar.	64	Sept.	61
April	64	Oct.	63
May	63	Nov.	65
June	62	Dec.	66
		Year	64

The rapid rise during the late spring and early summer is very marked. Hydrometer observations show a slight—very slight—increase in the density of the sea from July to September.

The cloud averages show two maxima in the course of the year, in February and in October, agreeing in this respect with Kimberley, and, in fact, with the greater part of the whole country lying between Natal and Pondoland on the east and Namaqualand on the west. The minima occur at the solstices. Neither of these turning-points show any special agreement with the monthly averages of rainfall, one reason possibly being that clouds of different types prevail at different seasons. Monthly averages are :—

	East London.	Kimberley.		East London.	Kimberley.
	8 a.m.	Mean.		8 a.m.	Mean.
Jan.	53%	40%	July	34%	17%
Feb.	56	42	Aug.	40	17
Mar.	50	35	Sept.	47	25
April	45	32	Oct.	56	31
May	39	21	Nov.	55	26
June	35	17	Dec.	52	37
			Year	47	28

In the East London Register the species of cloud does not appear,

* *Cf.* C. Stewart, *Science in South Africa*, pp. 25, 48, 51.

only the percentage of sky clouded, so that the relation between the clouds and the rain must be more or less conjectural; but if the conditions at Kimberley may be taken as a guide, there are maxima of clouds of a cirrus type in July and October, of a stratiform type in April and October, and of cumulus and allied species during the height of summer; and it is entirely due to the great increase in the two former in October that there is a general cloud maximum at that time.

Five years' observations of the direction from which the clouds are travelling have been made. Apparently they have been referred by the observers to magnetic North, and are read roughly to eight points. A rough correction to true North gives the following approximate Table of number of times the clouds have been observed moving from specified directions in five years :—

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
40	333	42	19	298	727	132	18

Some of these numbers doubtless include low-level driving mist. It will be seen that the prevailing cloud currents correspond to the directions of the prevailing winds (*i.e.*, N.E. and S.W.), excepting that the north-easterly cloud directions are relatively much less numerous than the same wind directions.* At Kimberley the prevailing cloud direction is very nearly west-north-west, four years' eye observations giving the following number of times seen :—

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
66	12	4	4	13	37	253	200

Thus neither at East London nor at Kimberley do clouds come to any extent from the south-east. Taken in conjunction with the fact that inshore winds are not frequent on the south-east coast of South Africa, these cloud directions furnish a strong argument against the "south-easterly rain-bearing winds" myth.†

The Table below gives particulars of the average monthly rainfall at the West Bank, East London, in the 21 years, 1884–1904,

* For these see J. R. Sutton, "The Winds of East London," *Q. J. R. Met. S.*, April, 1905.

† In occasional thunderstorms there are south-east winds. Sparrman mentions one during a hot spell of weather, which gave him a "headach," near the end of 1775. C. Stewart mentions an instance of a local thunderstorm at Port Elizabeth in which the wind was S.S.E.—S.

together with the greatest fall in one day, and the number of daily falls of assigned quantity :—

	Average.			Greatest Fall in one Day.	Number of Falls in 21 Years.		
	Monthly Fall.	No. of R. Days.	Fall per R. Day.		Less than 0·5 inch.	0·5 to 1·0 inch.	Greater than 1·0 inch.
	inches.	per month	inch.	inches.			
Jan.....	2·592	9·2	·275	2·07	166	16	11
Feb.....	2·206	9·3	·236	1·53	173	15	8
Mar.	2·288	9·2	·249	2·13	164	21	8
April	2·311	7·7	·301	3·15	131	21	9
May.....	1·653	5·0	·327	1·88	82	13	11
June	1·112	3·1	·359	2·77	50	8	7
July.....	·833	3·6	·230	2·10	68	5	3
Aug.	1·549	5·3	·293	3·09	93	13	5
Sept.	1·848	6·4	·287	1·90	109	18	8
Oct.....	2·266	9·4	·240	2·32	169	23	6
Nov.	2·452	9·3	·264	4·27	161	23	11
Dec.	2·153	7·7	·281	4·76	136	13	12
Year	23·263	85·2	·273	4·76	1,502	189	99

According to the Report of the Meteorological Commission for 1891, "the rain gauge is a permanent fixture on the ridge of the roof of the Port Captain's office, a tube leading from it down into his office," consequently, since the average velocity of the wind at East London is 20 miles an hour, we should expect the quantities of rain registered to be considerably too small. Fortunately "on the east side of the river, Mr. Padget, in the railway service, takes care of a rain gauge ; it is well placed on a good wooden stand in the yard of the maintenance department." A comparison between the annual quantities registered at the two places from 1883–1903, and published by the Meteorological Commission, shows great and varying differences between them, not only in the quantities but in the number of days reported. The average annual number of days of rain reported on the East Bank is 95, and only 77 on the West Bank. Only twice has the West Bank reported more days in the year than the other, and on two occasions it has reported only a few more than one-half. As for the annual totals, the West Bank fall varies from 55 per cent. to 90 per cent. of the East Bank totals. The averages for these 21 years are :—

	Inches.	Ratio.	Days.	Ratio.
East Bank.....	33·27	142	95	123
West Bank	23·42	100	77	100

In view of these differences it will be safer to regard the numbers in the previous Table as more or less approximate ratios.

The annual incidence of heavy rain is curious. It seems that in May and June more than 10 per cent. of the number of daily falls exceed an inch, whereas in October only 3 per cent. are so great. This confirms for East London what has previously been found for Kimberley, namely, that October differs in the character of its climate from all the other months.*

The Table below gives the direction of the wind, and of the cloud currents, immediately before and after rain in number of times observed, and for comparison the relative frequency of all winds :—

	Normal Wind Frequency.	Rain Wind.		Rain Cloud.	
		Beginning.	Ending.	Beginning.	Ending.
N.	19	8	11	4	8
N.E.	47	43	33	32	44
E.	9	2	6	1	4
S.E.	5	3	3	2	5
S.	16	5	7	22	28
S.W.	49	89	70	100	97
W.	39	49	69	25	15
N.W.....	22	7	7	2	1

We see from this that while the normal frequency of south-west winds is 49 times out of 206, the frequency before rain begins increases to 89 times. In fact, rain simply elongates the normal mechanical resultant in a south-westerly direction. During rain there seems to be a tendency for the vane to shift slightly, pointing more landwards.

The Tables at the end give in twelve columns, for each day of the year, the following elements :—

1. The date.
2. The mean barometric pressure at 32°.
3. The greatest pressure observed in 21 years.
4. The least pressure observed in 21 years.
5. The mean maximum temperature in the shade for the 24 hours ending 8 a.m. of the opposite date.
6. The absolute maximum.
7. The mean minimum temperature in the shade.
8. The absolute minimum.

* See J. R. Sutton, "An Introduction to the Study of South African Rainfall," *Trans. S. A. Phil. Soc.*, vol. xv., 1904.

9. The percentage of cloud.

10. The mean rainfall on the roof of the office of the Port Captain, for the 24 hours ending 8 a.m. of the opposite date.

11. The greatest fall in one day.

12. The number of times it has rained in 21 years on any given date.

One important point to be specially noted in these Tables is the spell of low pressure during the middle of July, and the following low maximum temperatures: the lowest mean maximum (and also the coldest day of the year) falling, just as it probably does everywhere else in South Africa, on July 17th.*

* The lowest value of mean daily maximum temperature—*i.e.*, 64°—appears opposite July 18th, and belongs, as explained in the text, to the 24 hours ending 8 a.m., July 18th. The *hottest* day at Greenwich is July 15th.

Jan.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches	inches	days.
1	29·941	30·169	29·631	75	85	63	56	47	·96	·85	3
2	·920	·143	·748	75	82	64	58	43	·24	·11	3
3	·894	·072	·569	77	84	65	57	54	·41	·12	5
4	·854	·205	·626	76	84	66	59	68	1·07	·73	5
5	·895	·086	·699	76	87	64	59	70	2·37	·47	10
6	·973	·207	·733	75	81	62	55	47	1·70	1·01	9
7	·964	·198	·787	75	84	63	55	38	1·40	·40	8
8	·909	·098	·656	74	84	64	56	47	1·37	·67	4
9	·867	·108	·717	76	85	63	56	54	2·32	·69	9
10	·877	·227	·465	75	81	63	56	54	1·36	·70	7
11	·941	·195	·716	76	81	65	58	55	1·48	·79	4
12	·878	·123	·669	75	83	64	56	45	·56	·44	3
13	·934	·138	·797	77	97	64	59	57	1·98	1·04	6
14	·894	·104	·716	75	85	65	60	56	1·06	·45	4
15	·912	·127	·576	75	80	65	55	58	1·54	·54	7
16	·884	·165	·441	77	85	65	56	52	·87	·59	4
17	·888	·146	·748	76	88	64	58	55	5·44	1·53	10
18	·930	·121	·698	76	81	63	56	47	2·44	1·36	6
19	·910	·169	·560	74	83	64	61	50	1·82	1·35	6
20	·932	·240	·684	75	80	64	57	62	·54	·34	5
21	·910	·135	·700	76	86	66	61	55	·68	·24	4
22	·934	·137	·718	76	88	66	60	53	·62	·23	4
23	·959	·211	·654	76	86	64	57	53	1·81	·67	8
24	·891	·207	·521	75	80	65	58	53	2·30	·76	8
25	·900	·157	·373	75	84	64	55	60	3·69	2·07	8
26	·916	·236	·687	77	87	65	52	61	3·14	1·20	8
27	·898	·320	·670	76	89	64	56	53	1·63	1·00	6
28	·900	·258	·622	77	80	65	59	56	1·22	·35	9
29	·935	·125	·702	76	81	65	54	54	2·90	1·67	6
30	·918	·183	·738	75	80	65	58	52	2·40	1·60	7
31	·949	·161	·734	76	89	64	54	45	1·78	1·10	7

Feb.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	29·976	30·216	29·660	75	83	63	54	48	1·10	·46	6
2	·944	·154	·769	76	82	65	60	57	·79	·35	4
3	·947	·127	·714	75	90	65	58	61	1·27	·73	7
4	·950	·111	·722	76	90	65	57	60	·56	·46	3
5	·904	·097	·704	76	89	65	60	61	·46	·22	3
6	·906	·094	·688	76	90	65	55	50	2·33	1·18	7
7	·938	·231	·628	76	86	64	56	70	2·80	·62	8
8	·943	·181	·626	76	89	64	58	51	3·28	1·32	9
9	·974	·238	·775	76	88	64	54	45	1·66	·63	8
10	·931	·159	·705	76	89	64	56	40	·85	·23	7
11	·903	·209	·575	76	91	64	60	37	·22	·09	4
12	·911	·156	·579	77	87	65	60	59	1·54	1·03	4
13	·918	·135	·710	75	79	64	57	56	1·06	·35	6
14	·950	·150	·765	75	80	65	55	64	1·03	·38	8
15	·958	·143	·683	77	83	65	56	50	2·61	1·30	8
16	·965	·161	·804	75	83	66	61	47	·86	·47	6
17	·923	·195	·550	76	84	66	60	57	1·40	·41	9
18	·898	·110	·636	76	88	65	60	61	·23	·20	2
19	·880	·266	·665	76	83	65	58	58	1·94	1·04	7
20	·913	·177	·714	76	84	65	59	56	·78	·24	6
21	·962	·283	·700	76	82	64	55	74	2·58	1·03	10
22	·966	·163	·627	75	82	64	59	44	1·79	·80	10
23	·962	·196	·776	75	81	65	60	66	·62	·27	6
24	·998	·250	·703	75	81	66	59	64	2·82	1·47	7
25	·984	·215	·731	76	87	65	60	73	4·54	1·53	12
26	30·011	·181	·852	74	82	65	61	60	3·10	·69	11
27	29·958	·302	·626	74	80	64	60	50	2·40	·70	10
28	·915	·228	·750	74	83	65	59	50	·56	·20	5
29*	·870	29·896	·828	76	82	65	63	57	1·15	·75	3

* Four Leap Years.

Mar.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	29·907	30·099	29·634	77	84	65	60	61	1·25	·54	7
2	·985	·228	·759	76	90	64	57	61	2·54	·98	6
3	30·032	·390	·768	76	82	63	56	50	·48	·22	6
4	29·986	.266	·757	74	78	63	58	45	·21	·18	3
5	·957	·132	·720	74	78	63	57	33	·49	·17	6
6	·979	·370	·704	75	80	64	57	63	·83	·67	4
7	·942	·287	·679	75	81	65	60	52	2·02	·90	9
8	·924	·270	·690	75	83	64	56	58	·55	·23	7
9	30·005	·275	·740	75	81	63	54	50	·82	·48	5
10	29·950	·244	·567	74	81	63	55	37	·62	·33	5
11	·967	·277	·702	75	84	63	55	55	1·11	·58	3
12	·964	·333	·676	77	84	64	56	46	·13	·04	4
13	·940	·283	·738	75	82	64	57	57	1·11	·30	7
14	·969	·173	·740	75	84	64	54	70	3·82	2·00	7
15	·964	·284	·737	73	79	62	56	50	3·87	2·13	9
16	·992	.240	·593	74	88	62	55	46	1·42	·35	7
17	·971	·213	·730	75	81	62	55	45	1·13	·42	6
18	·977	·157	·801	75	80	62	56	36	·62	·31	4
19	·969	·225	·645	74	81	63	54	52	1·15	·47	8
20	·958	·160	·737	73	79	62	54	70	3·62	1·20	9
21	·982	·332	·715	73	82	62	54	48	3·24	1·57	9
22	·983	·304	·802	74	77	61	53	51	3·64	1·75	9
23	·949	·243	·527	74	80	62	57	48	1·69	·55	7
24	·959	·325	·676	75	94	62	51	56	1·59	·51	10
25	·988	·246	·526	74	81	61	54	48	2·07	1·21	6
26	·959	·225	·716	75	101	61	54	38	1·36	·72	3
27	·949	·176	·664	75	79	62	52	39	1·37	·64	5
28	·951	·185	·735	74	79	62	59	60	·99	·46	5
29	·931	·313	·824	74	78	61	53	47	1·94	·74	8
30	·956	·273	·707	73	77	60	54	37	1·18	·43	7
31	·991	·309	·715	74	81	61	52	37	1·18	1·08	2

April.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	29·994	30·243	29·689	74	83	62	54	35	·56	·32	4
2	30·051	·390	·632	75	91	62	52	56	4·48	1·80	7
3	·043	·367	·816	73	79	59	50	41	5·78	3·15	7
4	·021	·320	·810	74	82	60	51	26	·39	·23	5
5	29·965	·207	·745	74	79	60	53	45	1·16	1·02	3
6	·961	·283	·768	74	88	61	53	46	1·65	·62	6
7	·988	·366	·680	73	83	61	53	55	3·43	2·17	6
8	30·015	·287	·774	72	84	60	55	38	1·02	·31	7
9	29·956	·232	·743	72	79	61	53	41	·86	·57	3
10	·984	·243	·670	73	79	61	55	50	·79	·32	4
11	·986	·325	·737	74	89	61	52	60	1·66	1·48	5
12	·981	·282	·770	75	106	60	50	56	2·31	·70	9
13	30·007	·231	·772	74	90	60	49	45	2·27	2·05	3
14	·041	·273	·818	75	95	59	52	42	1·58	·58	5
15	·022	·508	·630	74	90	61	51	39	1·05	·66	4
16	·007	·285	·681	75	98	61	52	62	·62	·30	6
17	·071	·309	·856	73	88	60	54	56	1·59	·63	9
18	·014	·301	·776	73	89	60	53	55	·58	·14	7
19	·023	·295	·824	72	78	59	54	38	1·05	·38	6
20	·045	·367	·776	72	78	59	53	51	2·47	·96	8
21	·026	·334	·801	72	81	57	51	37	1·20	·53	5
22	29·979	·429	·745	71	79	57	49	37	1·11	·39	5
23	·958	·214	·667	72	83	59	50	35	·99	·76	4
24	30·005	·453	·714	73	82	58	51	42	·47	·31	5
25	·049	·256	·698	73	89	58	47	37	·26	·20	4
26	·025	·230	·760	73	84	56	49	43	1·23	·73	5
27	·113	·306	·762	74	97	56	50	42	·84	·39	5
28	·095	·284	·809	71	78	55	48	41	2·00	1·16	5
29	·082	·345	·767	72	87	56	49	46	3·51	1·85	5
30	·065	·282	·825	72	79	57	52	41	1·63	·70	4

May.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·019	30·346	29·886	72	79	57	51	41	·40	·20	6
2	·021	·200	·659	73	81	57	50	40	2·03	1·88	4
3	·070	·427	·783	72	83	57	50	57	2·18	1·60	4
4	·054	·317	·699	71	79	57	48	42	2·24	1·42	5
5	·008	·213	·732	73	92	56	47	31	·20	·20	1
6	·029	·295	·702	72	92	56	48	43	·77	·50	2
7	·013	·261	·698	71	93	55	43	45	·64	·26	5
8	·047	·453	·804	71	83	55	48	45	1·02	·44	5
9	·078	·428	·765	73	89	55	43	47	2·23	1·45	6
10	·055	·360	·616	71	76	53	44	20	·83	·60	4
11	·028	·227	·813	72	93	54	47	49	·03	·03	1
12	·038	·311	·682	72	80	53	43	34	·74	·51	3
13	·037	·325	·516	74	93	54	48	34	·93	·83	3
14	·071	·381	·693	70	82	54	45	50	2·10	1·25	3
15	·000	·386	·754	70	86	55	48	40	2·00	1·02	4
16	·008	·415	·689	73	88	55	50	52	4·24	1·25	6
17	·064	·494	·778	72	94	56	47	52	·83	·30	6
18	·055	·414	·760	71	77	53	48	42	·64	·52	2
19	·086	·446	·786	71	80	53	44	31	·25	·25	1
20	·135	·401	·821	70	80	52	43	33	1·82	·77	4
21	·097	·393	·605	71	84	51	43	26	·08	·08	1
22	·044	·337	·609	70	83	52	45	27	·35	·21	2
23	·011	·305	·643	73	91	54	45	35	1·22	1·15	2
24	·007	·177	·756	74	92	53	42	32	·17	·08	3
25	·060	·340	·753	73	86	52	45	44	1·11	·92	3
26	·016	·506	·335	70	89	52	45	40	1·22	·62	4
27	·060	·361	·761	70	86	52	43	58	2·36	1·72	5
28	·153	·375	·576	71	84	50	45	33	1·07	·35	6
29	·138	·596	·661	69	80	50	44	34	·67	·44	4
30	·124	·461	·643	71	85	51	45	26	...	...	...
31	·106	·423	·811	72	84	50	44	30	·33	·33	1

June.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·083	30·478	29·664	74	89	51	42	27	...	...	...
2	·067	·444	·809	70	85	51	45	31	·11	·08	2
3	·129	·512	·709	73	90	51	43	41	1·42	·66	4
4	·114	·454	·859	70	82	50	46	23	·02	·02	1
5	·059	·315	·817	72	89	50	41	25	·19	·15	2
6	·110	·375	·839	75	91	52	45	43	...	...	...
7	·125	·390	·839	72	88	51	39	24	·05	·05	1
8	·127	·411	·803	71	86	51	42	32	2·31	2·15	2
9	·211	·501	·808	71	88	52	44	59	2·74	1·27	4
10	·163	·489	·786	69	88	50	45	40	4·35	2·77	5
11	·112	·417	·700	69	83	49	41	33	1·43	1·25	3
12	·114	·458	·857	72	87	50	40	48	1·42	·84	3
13	·110	·452	·750	70	85	48	42	22	1·34	1·04	4
14	·116	·473	·703	72	87	49	41	30	·08	·06	2
15	·147	·416	·908	71	82	49	42	33	·07	·07	1
16	·137	·334	·931	71	85	49	43	24	·04	·04	1
17	·101	·453	·809	70	85	50	41	35	·73	·45	3
18	·166	·486	·852	73	89	50	43	37	1·34	1·05	3
19	·147	·385	·796	70	87	51	40	32	·11	·07	2
20	·094	·320	·842	72	86	50	41	31	·15	·15	1
21	·093	·412	·886	72	84	51	44	37	·13	·13	1
22	·121	·475	·762	72	84	51	44	42	·14	·14	1
23	·104	·367	·754	72	87	50	41	31	·34	·31	2
24	·113	·397	·754	73	90	50	43	41	·61	·58	2
25	·155	·482	·875	72	84	50	44	33	·14	·14	1
26	·145	·442	·883	73	88	50	41	58	·40	·19	3
27	·154	·482	·819	72	88	52	43	41	1·46	·69	5
28	·139	·427	·672	70	76	50	43	28	·55	·50	2
29	·164	·490	·930	69	81	50	46	37	·36	·20	2
30	·197	·403	30·006	71	87	50	41	30	1·32	1·28	2

July.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·191	30·388	29·907	70	81	49	43	30	.07	·04	3
2	·140	·340	·952	69	80	49	37	40	·55	·21	4
3	·140	·339	·897	70	81	48	40	24	3·16	2·10	3
4	·151	·464	·809	71	82	50	44	40	...	...	...
5	·148	·527	·879	71	88	50	45	36	...	...	...
6	·149	·538	·878	70	80	49	43	30	·13+	·13+	1
7	·115	·413	·805	71	82	48	39	23	·85	·85	1
8	·127	·343	·671	71	84	48	40	22	·21	·21	1
9	·133	·360	·822	69	83	48	41	28	...	...	...
10	·136	·353	·813	69	80	48	40	33	·58+	·28+	3
11	·182	·502	·882	69	81	48	42	34	·17	·17	1
12	·134	·423	·694	67	86	49	39	27	·30	·24	3
13	·080	·379	·869	71	86	51	43	30	1·75	1·55	4
14	·053	·380	·750	72	88	53	45	52	1·14	1·10	2
15	·067	·364	·856	73	86	49	41	33	·15	·09	3
16	·084	·333	·611	70	86	49	41	43	...	...	...
17	·181	·470	·962	68	86	48	44	48	1·12	·28	8
18	·219	·566	·991	64	71	49	40	39	·97	·42	5
19	·183	·648	·725	66	73	48	40	32	1·05	·64	3
20	·194	·522	·810	69	87	48	43	25	·23	·23	1
21	·144	·378	·793	69	81	47	41	32	·58	·44	2
22	·080	·366	·772	70	86	51	44	33	·C2	·02	1
23	·116	·374	·633	71	93	51	41	34	·15	·15	1
24	·135	·489	·735	68	75	50	41	43	·11	·06	3
25	·200	·510	·931	69	87	49	43	33	·29	·12	4
26	·211	·485	·879	68	73	49	42	39	·62	·46	2
27	·184	·541	·778	68	85	50	43	32	·80	·60	4
28	·127	·452	·733	69	88	50	36	35	·92	·49	3
29	·081	·374	·800	70	87	50	41	38	·33	·18	4
30	·091	·449	·769	71	88	51	44	43	·08	·06	2
31	·134	·556	·842	71	82	49	40	25	1·16	·60	4

Aug.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·105	30·410	29·834	70	82	50	42	33	·46	·31	3
2	·140	·406	·881	68	75	50	44	38	1·09	·88	3
3	·119	·398	·819	68	72	49	40	29	·22	·12	2
4	·056	·307	·780	71	85	51	41	33	·56	·33	2
5	·137	·650	·809	71	87	53	46	46	·06	·06	1
6	·149	·718	·821	69	91	52	44	34	1·23	·76	7
7	·104	·550	·695	70	98	52	45	37	1·67	1·00	5
8	·136	·411	·854	69	92	51	40	25	·17	·12	2
9	·089	·257	·885	68	78	51	43	43	1·78	1·10	4
10	·113	·422	·864	68	76	51	44	36	3·72	3·09	4
11	·042	·371	·571	71	90	51	41	34	·12	·12	1
12	·104	·386	·672	69	94	51	47	42	·35	·17	3
13	·099	·468	·657	69	80	50	41	40	·64	·32	3
14	·151	·422	·551	69	92	52	43	48	·61	·40	3
15	·072	·357	·721	68	90	50	43	20	·85	·54	4
16	·050	·244	·608	70	92	52	42	35	·76	·70	2
17	·160	·508	·818	70	87	51	44	58	·28	·15	3
18	·149	·436	·919	68	94	51	43	42	1·14	·41	6
19	·115	·480	·828	68	91	51	43	47	1·85	1·67	3
20	·134	·474	·855	69	89	51	42	52	1·67	·64	4
21	·117	·424	·790	69	89	51	44	25	·75	·41	4
22	·110	·421	·787	70	85	51	44	41	·90	·60	4
23	·040	·438	·696	72	96	54	44	40	2·24	1·86	5
24	·106	·409	·830	74	90	53	42	51	·65	·31	4
25	·105	·405	·755	68	75	54	42	46	1·59	·62	7
26	·043	·528	·558	72	90	54	37	53	1·56	1·00	5
27	·081	·502	·571	70	92	53	45	47	·48	·31	3
28	·098	·470	·852	71	94	53	43	50	1·22	·48	4
29	·064	·386	·745	68	74	53	43	33	·20	·12	2
30	·068	·593	·837	69	76	53	43	45	2·55	1·76	6
31	·111	·463	·818	69	76	53	45	45	1·15	·75	2

Sept.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·182	30·440	29·931	69	95	52	45	40	1·71	·76	3
2	·252	·588	·773	69	92	52	45	45	1·49	·93	6
3	·164	·535	·653	68	85	53	43	50	1·92	1·08	5
4	·092	·515	·827	69	94	54	44	47	2·39	1·75	7
5	·153	·535	·833	70	92	55	49	45	·02	·02	1
6	·137	·402	·750	69	93	53	44	44	·71	·29	4
7	·070	·324	·809	67	73	54	45	44	·78	·38	3
8	·042	·586	·697	70	78	53	44	36	1·12	·60	4
9	·087	·369	·863	70	89	53	48	56	1·50	·70	7
10	·111	·550	·828	67	72	52	44	54	5·58	1·90	7
11	·143	·616	·833	67	92	52	45	48	2·57	1·12	7
12	·093	·418	·700	69	98	53	46	45	·79	·58	4
13	·093	·403	·759	67	72	53	43	47	·30	·22	3
14	·176	·503	·852	68	73	52	43	48	1·75	1·02	4
15	·155	·447	·800	67	86	53	46	42	·91	·37	6
16	·072	·492	·664	71	94	54	44	46	1·08	·50	4
17	·109	·363	·762	69	83	54	44	47	·92	·37	3
18	·137	·381	·870	70	90	55	44	38	1·15	·83	4
19	·097	·370	·772	69	78	56	47	47	1·07	·75	6
20	·066	·401	·760	69	79	57	48	49	1·09	·62	3
21	·038	·413	·620	70	85	56	49	44	·28	·15	3
22	·040	·296	·585	69	76	56	51	49	·73	·42	3
23	·023	·323	·549	69	75	56	48	52	1·00	·53	4
24	·082	·284	·770	71	79	55	48	44	1·21	·62	5
25	·081	·360	·819	70	75	56	50	60	1·09	·54	6
26	·046	·433	·734	69	78	57	53	64	2·67	1·31	7
27	·094	·385	·754	70	78	56	45	48	1·15	·62	6
28	·011	·243	·647	70	78	56	50	33	·31	·30	2
29	·013	·336	·612	71	78	58	47	40	·85	·50	4
30	·016	·264	·658	70	78	58	50	59	·66	·42	4

Oct.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·020	30·303	29·783	70	76	58	49	48	1·11	·53	4
2	·041	·338	·764	69	74	56	47	47	·64	·25	5
3	·081	·564	·696	69	77	55	45	58	2·07	·95	5
4	·077	·538	·801	69	77	54	43	61	1·32	·75	6
5	·020	·623	·615	70	93	56	46	61	2·85	1·55	4
6	·038	·344	·462	72	98	57	48	52	·78	·27	6
7	·081	·413	·623	71	93	57	49	62	1·06	·36	8
8	·042	·489	·709	69	78	56	45	58	5·41	2·32	9
9	·057	·473	·770	70	82	56	45	46	2·66	1·10	8
10	·036	·425	·768	69	76	56	44	45	·73	·67	3
11	29·996	·342	·752	71	76	57	46	50	2·04	·67	6
12	30·011	·383	·700	70	85	57	48	76	·87	·31	5
13	·086	·403	·697	69	74	57	48	63	1·80	·47	8
14	·045	·374	·637	68	75	56	49	54	1·52	·75	4
15	·120	·389	·869	70	77	56	47	64	1·30	·30	7
16	·080	·392	·678	70	79	58	49	60	1·29	·87	7
17	29·978	·304	·684	70	77	58	47	53	1·41	·97	3
18	30·029	·293	·800	71	77	58	50	55	·88	·25	9
19	·006	·290	·690	71	80	58	49	58	·50	·19	4
20	·045	·327	·835	70	74	58	49	68	1·18	·20	10
21	·038	·304	·781	70	79	57	47	57	2·10	·49	13
22	29·991	·407	·737	69	76	57	49	48	1·48	·51	8
23	30·049	·511	·642	70	78	56	48	53	·99	·40	6
24	·005	·481	·614	71	79	57	49	59	·46	·14	5
25	·070	·415	·727	71	78	57	49	55	1·26	·40	8
26	·019	·491	·724	70	74	56	42	58	1·74	·86	7
27	29·971	·302	·745	70	77	59	47	61	1·25	·58	7
28	·916	·213	·547	71	82	60	52	51	1·27	·60	6
29	·993	·195	·784	72	90	58	48	43	3·21	1·40	8
30	30·006	·330	·714	71	77	57	51	55	·65	·59	3
31	·007	·239	·647	71	80	57	50	47	1·77	1·02	6

Nov.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches.	days.
1	30·020	30·385	29·732	70	79	57	50	60	1·93	·83	3
2	29·906	·241	·715	70	74	59	50	52	·60	·25	5
3	·984	·287	·694	72	83	59	55	73	1·49	·55	4
4	·989	·354	·600	70	76	59	50	50	1·20	·47	8
5	30·007	·229	·749	71	78	56	48	48	·99	·47	4
6	29·990	·257	.679	71	78	59	51	63	1·97	1·01	6
7	·996	·291	·802	72	77	59	51	63	2·79	1·13	9
8	30·032	·450	·744	71	75	59	52	52	2·88	1·23	9
9	29·979	·414	·736	71	77	59	49	49	1·39	1·14	5
10	·930	·085	·630	72	77	59	52	38	·45	·37	4
11	·944	·111	·684	72	81	60	55	57	·60	·19	7
12	·994	·364	·765	72	82	60	50	57	·46	·19	5
13	30·001	·360	·702	72	83	61	53	66	2·55	1·09	12
14	29·986	·284	·662	70	75	59	51	52	3·91	1·25	7
15	·993	·201	·702	71	82	60	53	50	5·36	4·27	6
16	30·015	·310	·770	73	82	61	52	44	·86	·42	6
17	29·935	·264	·649	73	81	61	54	61	1·53	·87	5
18	·972	·188	·661	72	80	60	52	55	3·05	1·65	6
19	·954	·240	·695	71	76	61	53	69	3·61	·81	9
20	·957	·230	·427	71	76	60	55	46	2·22	·80	8
21	.939	·306	·612	72	75	59	51	41	1·31	·63	7
22	30·009	·235	·797	73	81	60	51	50	2·04	1·30	5
23	29·989	·286	·670	72	78	61	55	55	1·50	·62	8
24	·976	·201	·678	72	78	62	55	57	1·62	·80	8
25	·942	·180	·735	72	88	62	54	53	·85	·25	7
26	·970	·213	·773	73	77	61	54	55	·82	·29	9
27	·955	·278	·763	72	78	61	53	61	1·96	1·12	8
28	·938	·349	·734	73	84	61	54	44	·47	·26	4
29	·948	·130	·531	74	85	61	54	39	·05	·03	2
30	·940	·339	·541	74	78	62	55	63	2·03	·75	9

Dec.	P	MP	*m*P	M	M′	*m*	*m*′	C	R	R′	R
	inches.	inches.	inches.	o	o	o	o	%	inches.	inches	days.
1	29·944	30·256	29·695	72	78	62	52	61	·58	·28	7
2	·939	·153	·590	73	84	63	53	55	1·04	·57	5
3	·964	·214	·677	74	86	62	50	48	·77	·35	5
4	·980	·310	·700	73	78	61	55	46	·66	·36	5
5	·935	·211	·628	73	80	61	53	46	1·19	·58	4
6	·898	·094	·681	74	84	62	56	37	·32	·14	5
7	·946	·176	·497	76	94	62	56	50	1·71	1·15	7
8	·968	·171	·735	76	94	62	56	45	·32	·23	3
9	·915	·247	·618	75	85	63	56	42	2·04	1·09	6
10	·968	·211	·637	75	80	62	56	57	1·43	1·17	4
11	·936	·307	·624	73	79	63	55	53	·36	·14	5
12	·960	·302	·621	74	81	62	55	50	1·45	1·03	5
13	·932	·211	·696	74	80	63	54	56	1·59	·75	5
14	·988	·316	·639	74	84	63	47	58	1·77	1·75	2
15	·929	·353	·498	74	83	63	53	42	2·42	1·40	5
16	·938	·377	·521	75	85	63	55	51	·39	·22	4
17	·958	·241	·615	75	81	64	55	51	·28	·24	3
18	·881	·151	·524	75	88	64	55	41	·42	·18	5
19	·911	·091	·702	74	81	64	55	79	3·68	1·38	6
20	·907	·226	·505	74	86	63	54	78	6·32	4·76	8
21	·949	·224	·672	75	90	62	55	56	2·90	·83	8
22	·913	·164	·659	74	81	62	57	42	·52	·32	3
23	·938	·200	·734	75	83	63	57	42	·36	·18	4
24	·992	·289	·829	75	87	63	57	55	1·85	1·06	6
25	·954	·182	·797	74	85	62	55	41	·89	·50	3
26	·939	·139	·725	75	89	63	55	52	·46	·23	3
27	·934	·101	·730	75	83	64	53	47	1·93	·83	6
28	·912	·124	·623	75	84	64	57	47	1·48	·60	6
29	·889	·160	·624	76	85	64	60	58	1·65	1·17	4
30	·966	·357	·679	75	80	63	59	64	2·31	·42	13
31	.998	·354	·767	74	86	63	56	64	2·13	1·05	6